United States Department of Agriculture
Agricultural Research Service
National Program Staff
Beltsville, Maryland 20705

November 19, 1999

Dear Participant:

Welcome to the Bees and Pollinators Program Component Workshop. I appreciate your willingness to participate in this important effort to shape the agenda for future Agricultural Research Service (ARS) research on crop pollinators.

This workshop is designed to gather your input and suggestions for the future directions of this National Program component. As you may already know, ARS is conducting a series of these workshops in conjunction with the development of 5-year research plans for each of our 23 National Programs. The workshops are designed to hear from you in open forum and to gather your ideas regarding future research directions in this important area of our National Programs.

Your input as an ARS customer, stakeholder, partner, or scientist is critical to shaping the future direction of this important research program and is, therefore, of great value to us. If you are an ARS **partner, customer, or stakeholder**, I charge each of you to be candid and forthright in sharing your thoughts on the future research agenda. If you are an ARS **scientist**, your charge is to listen. This workshop is a special opportunity to hear first hand the research needs identified by the participants. Your creativity, input, and insights will be of tremendous importance in the next stage of the process as we develop the research action plan.

It is my hope that the exchange and collaboration during this session will further our working relationships. You will all play a valuable role in shaping the ARS national research agenda. The more we communicate with you and you with us, the more successful our ARS program will be overall. This ongoing communication cycle is imperative to our future success and to the future of agricultural research.

Thank you all for taking the time from your busy schedules to be with us during the workshop. Your participation and your ideas are shaping the future of ARS as we move toward the 21st century. Work hard! Best wishes for a successful meeting. Once again, thank you.

Sincerely,

K. DARWIN MURRELL
Deputy Administrator

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ARS National Program Workshop on Bees and Pollination
(NP 305 Crop Production)
November 19 - 20, 1999

Holiday Inn
10000 Baltimore Avenue
College Park, Maryland

Friday, November 19, 1999

7:30 a.m.	**Registration**	
8:00 a.m.	Welcome and Introduction	Dr. S. Karl Narang, ARS
8:05 a.m.	Charge to the Workshop	Dr. Caird E. Rexroad, Jr., ARS
8:15 a.m.	Overview of Component – Bees and Pollination of NP 305: Crop Production	Dr. S. Karl Narang
8:30 a.m.	Customers'/Stakeholders' Perspectives on critical issues/problems and needs	Dr. S. Karl Narang, Moderator

Industry Presentations

8:35 a.m.	American Honey Producers Association (AHPA)	Mr. Richard Adee
8:45 a.m.	American Beekeeping Federation (ABF)	Mr. David Hackenberg
8:55 a.m.	U.S. Beekeepers	Mr. Glenn Gibson
9:15 a.m.	AHPA	Mr.Lyle Johnston
9:25 a.m.	*Break*	
9:45 a.m.	ABF	Mr. Troy Fore, Jr.
9:55 a.m.	ARS-University Cooperation	Dr. Dewey Caron
10:05 a.m.	ABF	Mr. Reg Wilbanks
10:15 a.m.	ABF	Mr. Pat Heitkam
10:25 a.m.	ABF	Mr. Gene Brandi

Friday, November 19, 1999 (continued)

Producer/Grower/Partner Presentations

10:35 a.m.	Farm Bureau	Mr. Scott Rawlins
10:45 a.m.	Delivering the blue orchard bee	Mr. Lamar Chet Kendall
10:55 a.m.	Alternative pollinators for almond	Mr. John Brandeberry
11:05 a.m.	Improving cranberry yields	Mr. Patrick Slavin
11:15 a.m.	Future of custom pollination	Dr. Ron Bitner
11:25 a.m.	Improving alfalfa seed yields	Mr. Jim Langley
11:35 a.m.	Pollination and Conservation Issues	Dr. Howard Ginsberg

11:55 a.m. **Lunch Presentation –**
"ARS Information and Technology Transfer" — Mr. Sean Adams, Chief, Current Information Branch, ARS Information Staff

ARS Scientists Presentations

Program Overview		Dr. Hachiro Shimanuki, Moderator
1:00 p.m.	Mite-resistant honey bee research	Dr. Tom Rinderer
1:15 p.m.	Pests, parasites and disease research	Dr. Mark Feldlaufer
1:30 p.m.	Management of non-*Apis* pollinators	Drs. Bill Kemp/Jordi Bosch
1:45 p.m.	Pollination and Africanized honey bees	Drs. Eric Erickson/ Gloria DeGrandi-Hoffman
2:00 p.m.	New approaches for the control of pests and parasites	Drs. Bill Wilson/Patti Elzen
2:15 p.m.	*Break*	
2:30 p.m.	**Charge to Breakout Groups (Sessions I and II)**	**Dr. Kevin Hackett**

2:40 p.m. **Breakout Session - I. Customer needs/critical issues**
The product of this session will be a comprehensive list of research needs/critical issues identified by customers/stakeholders for each breakout group.

Breakout Groups (subcomponents):

1. Bee Management	Mr. Sean Adams, ARS/Information
2. Pollination	Ms. Jane Gates, NAL
3. Pest Management	Ms Susan Wilzer, NAL

4:30 p.m. **Outcome and discussion** — **Dr. Kevin Hackett**
The Reporter (a Customer or Stakeholder) from each breakout group will provide a brief overview of the conclusions of the group.

5:00 p.m. Adjourn for the day

Saturday, November 20, 1999

8:00 a.m. **Breakout Session II - Focusing on research priorities**
The product will be a list of priority issues and research needs for each program subcomponent (same as breakout groups).

9:30 a.m. *Break*

10:00 a.m. **Outcome and discussion** **Dr. Kevin Hackett**
The Reporter (a Customer or Stakeholder) from each breakout group will provide a brief overview of the conclusions of the group.

11:30 a.m. **Farewell to customers and stakeholders -** **Dr. S. Karl Narang/ Dr. Hachiro Shimanuki**

Review and explanation of the process for the preparation of the final version of the component - Bees and Pollination (NP 305 Crop Production) using the customer/stakeholder input.

12:00 p.m. **Adjourn for customers and stakeholders**

Special Session: ARS Staff and Scientists

1:00 p.m. **Field involvement in the National Program component – Dr. S. Karl Narang**

Workshop Summary Report and Action Plan assignments
The product will be a comprehensive working list of priority research needs/issues for each National Program subcomponent that will be used later by assigned ARS scientists and team members to write the Action Plan.

Subcomponents: Responsible SY for Report and Action Plan

Non-*Apis* bees	Dr. Bill Kemp
Pollination	Dr. Gloria DeGrandi-Hoffman
	Dr. Jordi Bosch
Honey bee pests	Dr. Bill Wilson
Parasites	Dr. Tom Rinderer
Diseases	Dr. Hachiro Shimanuki

2:00 p.m. **Adjourn**

CROP PRODUCTION

Program Rationale:
Production capacity, production efficiency, and crop protection are major pillars supporting national crop productivity. A high priority is the development and subsequent transfer to customers of efficient crop production and sustainable cropping systems. Overall challenges are to substantially increase the knowledge base of, and sustainable technology for crop production and cropping systems; to improve the delivery of technologies generated; and to promote the use of these systems. The program is expected to yield one or more production practices that can be integrated into a system for managing plant population densities, fertility, pollination, irrigation and other cultural practices in an efficient and effective manner. Meeting these goals will require bringing emerging technological capabilities together to support immediate and long-range strategies aimed at future crop production, protection, and food safety challenges for small, medium and large-sized farms, including organic farming systems. It will also require substantive collaborations with the customers in program planning, research and evaluation. The program closely ties in with the whole farm management strategies of the Integrated Farming Systems National Program. Pest management systems are a vital component to crop production and strong linkages to the Crop Protection and Quarantine, to the Soil Resource Management, and to the Plant Diseases National Programs are essential and recognized. This program does not specifically include development of integrated pest management systems and basic studies relating to improving, maintaining or restoring the inherent production capability of soils, since these are handled by other National Programs.

Program Components

Bees and Pollination - This component will help develop new technologies, including germplasm enhancement and preservation and genetic improvement, leading to sustainable strategies for using bees as pollinators to increase crop production. At the same time these technologies will help maintain the profitability for providers of bees that are used in the pollination and honey production industry and will help U.S. farmers to remain competitive in the global market place. The discovery of two parasitic mites of honey bees in the 1980's, the invasion of the Africanized honey bee in 1990, and diseases of both Apis and non-Apis bees, as well as other bee pests, is seriously impacting on the availability of pollinators. Technology for the rapid detection and control of parasitic mites and other diseases of pollinators will enhance pollination efficiency and honey production.

Crop Management and Production Efficiency - This component will develop new cutting- edge, crop production principles and practices, and provide the necessary agronomic principles, technologies, and approaches associated with the efficient production and fertility of crops, including organic farming systems. Research

undertaken in this component will (a) help fill the knowledge gap needed for applying appropriate principles and practices to cropping systems under differing ecological and climatic situations, and (b) furnish the agronomic principles needed for crop production. Evaluation of integrated production management systems is an important area of research in this component.

Agroengineering, Agrochemical and Related Technology - This component will help develop more effective production, harvesting and tillage equipment, sensor technology, irrigation, and pesticide application methodologies and other tools and cultural practices for crop production. The component also includes developing appropriate practices for the use and incorporation into cropping systems of products generated through biotechnology.

Models and Other Decision Aids - This component will provide user-friendly crop production and protection models and decision-aids for (a) assessing alternative biological, economical, and related production and management practices, (b) maximizing processing, and (c) increasing energy-use efficiency. Application of remote sensing and other automated sampling methodologies in managing plant population densities, fertility, irrigation, and other cultural practices are important aspects of this component.

Projected Outcomes/Impacts of Program Over Next 5 Years

New knowledge and methods for crop production in both traditional and organic farming systems that will allow for a more sustainable agriculture.

- **New environmentally-friendly chemicals, biopesticides, and mite-resistant bee stocks will be made available to beekeepers for the control of two of the most serious honey bee parasitic mites, the small hive beetle, Africanized bees, and harmful pathogens in order to reduce the use of pesticides and to help ensure the availability of quality pollinators. New technologies leading to sustainable strategies for using bees as pollinators to increase crop production will also be developed, as well as efforts towards enhanced honeybee germplasm diversity and preservation, and genetic improvement.**
- Improved agroengineering/agrochemical technology and biotechnology useful in traditional and organic crop production and protection activities that will improve production efficiency and product and environmental quality.
- New or improved user-friendly models and decision aids for sustainable crop production and protection systems that growers will find effective in assessing alternative crop production and management practices, while at the same time improving energy efficiency and pest control.

National Program Team Members

Robert M Faust (co-leader) - Field & Horticulture Crop Entomology

Kevin J Hackett (co-leader) - Biological Control

Carroll R Amerman - Soil Erosion

Peter K Bretting - Plant Germplasm & Genomes

Dwayne R Buxton - Oilseeds & Bioscience

Ernest S Delfosse - Weed Science

Sudhir K Narang - Medical and Veterinary Entomology

Eric Rosenquist - International Program Coordinator

Vacant - Engineering/Energy

Robert J Wright - Soil Management

National Program Components and Locations

	Program Components			
Locations	Crop Management and Production Efficiency	Bees and Pollination	Agroengineering, Agrochemical, and Related Technology	Models and Other Decision Aids
Ames, IA				
Baton Rouge, LA				
Beltsville, MD				
Byron, GA				
Canal Point, FL				
College Station, TX				
Corvallis, OR				
Dawson, GA				
East Lansing, MI				
Florence, SC				
Fort Collins, CO				
Fresno, CA				
Gainesville, FL				
Ithaca, NY				
Kearneysville, WV				
Lane, OK				
Logan, UT				
Lubbock, TX				
Madison, WI				
Manhattan, KS				
Mayaguez, PR				
Mississippi State, MS				
Morris, MN				

New Orleans, LA				
Orlando, FL				
Phoenix, AZ				
Poplarville, MS				
Pullman, WA				
Raleigh, NC				
Sidney, MT				
St. Paul, MN				
Stillwater, OK				
Stoneville, MS				
Tifton, GA				
Tucson, AZ				
Washington, DC				
Weslaco, TX				
Wooster, OH				
Wyndmoor, PA				

ARS Research Areas

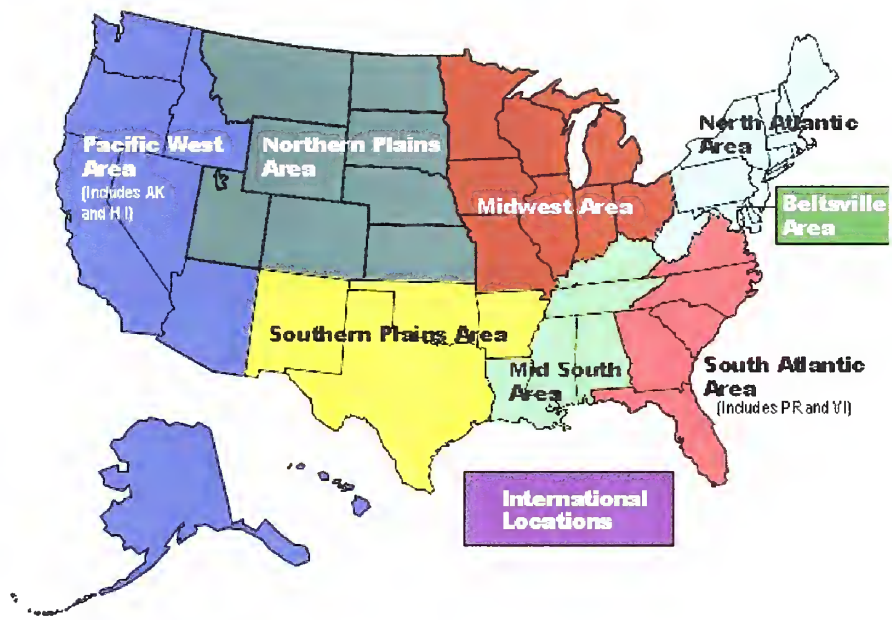
and

Bees and Pollinators Research Locations

ARS Research Areas

and

Bees and Pollinators Research Locations



Beltsville Area - Beltsville, Maryland
Bee Research Laboratory

Mid South Area- Baton Rouge, Lousiana
Honey Bee Breeding, Genetics and Physiology Research Unit

Northern Plains Area - Logan, Utah
Pollinating Insect-Biology, Management and Systematics Research Unit

Pacific West Area - Tucson, Arizona
Carl Hayden Bee Research Center

Southern Plains Area - Weslaco, Texas
Beneficial Insects Research Unit

BEE RESEARCH LABORATORY
Beltsville, Maryland

Mission: The mission of the Bee Research Laboratory (BRL) in Beltsville is to conduct research on the biology and control of honey bee parasites, diseases, and pests to ensure an adequate supply of bees for pollination and honey production. Using biological, molecular, chemical and non-chemical approaches, scientists are developing new, cost-effective strategies for controlling parasitic mites like *Varroa jacobsoni*, bacterial diseases like American foulbrood, and emergent pests like the small hive beetle. An additional focus of the Laboratory is to develop preservation techniques for honey bee germplasm to maintain genetic diversity and superior honey bee stock. Bee Research Laboratory staff also provides authoritative identification of Africanized honey bees and diagnosis of bee diseases and pests for Federal and State regulatory agencies and beekeepers on a worldwide basis.

Problems Being Investigated: The BRL has several major research thrusts that include the integrated pest management of parasitic mites of honey bees (focusing primarily on *Varroa*); viral and bacterial diseases of honey bees (research on the biology of the small hive beetle *Aethina tumida*, a recently introduced pest, is being investigated under this thrust); and preservation of honey bee germplasm. Smaller projects like control of the greater waxmoth are in progress. As mentioned in the mission statement, biological, molecular, chemical and bee management approaches are used to investigate these problems.

Major Accomplishments: ***Parasitic mites:*** a) A modified hive bottom/screened insert was developed to reduce the impact of *Varroa*. This physical barrier prevents fallen and dislodged mites from re-attaching to bees, and contributes to an overall *Varroa* control program. Descriptions and illustrations of the screened insert have been released to trade journals and are currently available to beekeepers. b) An EPA registration has been issued and a patent has been granted for formic acid gel. The gel will hopefully contribute to a *Varroa* and tracheal mite control program. ***Viral and bacterial diseases:*** a) Oxytetracycline (OTC)-resistant forms of the bacterium that causes American foulbrood disease have been detected in the U.S. and in samples from Canada. b) Analyses of "extender patties" showed OTC content variable and content decreased over time (4.5% per year). ***Small hive beetle:*** a) Specimens of small hive beetles collected in the U.S. and in South Africa were shown to be genetically similar, indicating research on parasites and pathogens in South Africa will be applicable to U.S. populations. b) Temperature/moisture studies indicate eggs will not hatch when the temperature is below 10 degrees centigrade (50F); larvae fail to develop when soil moisture is less than 5% or greater than 25%. c) Sterol inhibitor IPL-12 (N,N-dimethyldodecamine) prevents ovarian development in adult females when supplied in a pollen:honey (3:1) mixture. ***Germplasm preservation:*** a) A dual fluorescent staining technique was developed to assess the viability of honey bee sperm; allows direct determination of sperm survival after experimental treatment, eliminating need for artificial insemination of queens. b) Determined that queens artificially inseminated with semen containing only 50% live sperm can achieve normal brood numbers and patterns.

Future Directions: Combine thrusts on parasitic mites and viral/bacterial diseases to consolidate the research effort. Use molecular markers (microsatellite DNA loci) to determine the seasonal movement of *Varroa* infestations. Develop molecular markers to identify bee stock of Russian origin and identify the gene(s) that confer resistance (in collaboration with Baton Rouge). Expand research on the biology/control of the small hive beetle. Continue research effort to preserve honey bee germplasm (eggs and semen). Examine the underlying nutritional component of winter bee losses in an effort to reduce the impact of parasites and diseases.

INTEGRATED PEST MANAGEMENT OF PARASITIC MITE OF HONEY BEES AND USING SOLITARY BEES FOR POLLINATION

Project: 1275-21000-125-00D

Location: Beltsville, Maryland

Researchers: Mark F. Feldlaufer
Hachiro Shimanuki
Jan P. Kochansky
Jay D. Evans
Akey C. Hung
Jeffery S. Pettis

Net to Loc: $840,172

Objectives:

(1) Develop in vitro rearing methods to support Varroa growth and development.

(2) Screen, evaluate and field-test environmentally compatible compounds for efficacy in controlling parasitic bee mites.

(3) Develop rapid, reliable and accurate means to detect mite resistance to fluvalinate & other miticides.

(4) Assess impact of parasitic mite infestations on pollination by honey bees.

(5) Evaluate solitary bees as pollinators of small crops.

Approach:

Determine the physical/chemical/nutritional environment required by parasitic mites for survival outside the hive. Determine toxicity of selected natural products to honey bees and evaluate their efficacy in a mite control program. Formulate varying amounts of fluvalinate and other acaricides into an easily used field kit to monitor resistance. Use pollen traps at hive entrances of mite infested and uninfested honey bees to evaluate pollination efficiency. Design artificial breeding sites to improve the use of solitary bees in commercial fruit operations.

VIRAL AND BACTERIAL DISEASES OF HONEY BEES

Project: 1275-21000-136-00D

Location: Beltsville, Maryland

Researchers: Hachiro Shimanuki
Mark Feldlaufer
Akey C. Hung
Jeffery S. Pettis
Jay D. Evans
Jan P. Kochansky

Net to Loc: $588,912

Objectives:

(1) Developing diagnostic methods for bee diseases of viral origin.

(2) Determining the economic impact and mode of transmission of viral diseases

(3) Developing biological methods to control small hive beetle (SHB).

(4) Determining economic thresholds of SHB and methods to eliminate beetles in honey processing.

(5) Identify alternate material(s) for the control of American and European foulbrood.

Approach:

Develop molecular methods for the diagnosis of viral diseases of honey bees and to determine their economic impact. Develop alternate methods for the control of American foulbrood disease. Develop cultural and biological methods to control small hive beetle (SHB) larvae, determine population dynamics and economic thresholds of SHB, improve sanitary methods to eliminate beetles in honey processing. Develop new methods to control wax moth. Identify candidate materials for the control of chalkbrood disease.

PRESERVATION OF HONEY BEE GERMPLASM

Project: 1275-21220-092-00D

Location: Beltsville, Maryland

Researchers: Anita M. Collins
Jay D. Evans
Jeffery S. Pettis
Mark F. Feldlaufer

Net to Loc: $325,804

Objectives:

Improvement of our ability to maintain specific genetic strains of honey bees without maintaining individual colonies and provide ID of specific honey bee types.

(1) Develop optimum methods for the in vitro preservation of honey bee semen.

(2) Develop methods for the in vitro preservation of honey bee embryos.

(3) Determine the biochemical and physiological environment that enables honey bee sperm to remain viable in queen spermathecae.

(4) Design/implement a germplasm collection protocol.

Approach:

The primary focus of this project is to develop practical methods of germplasm preservation for honey bees, using cryopreservation or some other method suggested by the physiology of natural spermathecal storage (objectives 1, 2, & 3). This technology is needed to preserve genetic diversity of this species in the United States, especially because of severe losses to parasitic mites and disease, and to assist in the development of selected stocks of bees. A secondary focus of the project is to continue authoritative identification of Africanized honey bees, and to extend our ability to characterize diversity in honey bee populations. Once preservation methodology is available, a collection scheme to maximize diversity in preserved germplasm will be needed.

HONEY BEE BREEDING, GENETICS AND PHYSIOLOGY RESEARCH UNIT
Baton Rouge, Louisiana

Mission: The mission of the Honey Bee Breeding, Genetics and Physiology Research Unit is directly related to improving honey bee stock and honey bee management related to stock improvement. This broad mission includes components related to problems caused by varroa mites, tracheal mites and Africanized honey bees. The devastating problems caused by varroa mites and the serious problems caused by tracheal mites are targeted as the most critical. Scientists are engaged in breeding and testing honey bees for resistance to mites, evaluations of mite-bee interactions to better describe breeding criteria, and evaluating stock production processes to explore and solve stock production problems caused by mites.

Problems Being Investigated: Varroa mites: The current greatest biological problem for the beekeeping industry is the varroa mite. This problem shifted from being critical to being a crisis in 1997 when varroa populations were found that are resistant to fluvalinate, the only registered chemical for their control. Almost the entire unit is directed to develop varroa resistant honey bee stock and bee breeding methods to circumvent the varroa mite plague. **Tracheal mites**: Prior to the discovery of varroa mites in the United States, tracheal mites were a serious plague for beekeeping nationally. Especially in northern states they still are a serious plague. Currently, one scientist's work is on tracheal mites. Tracheal mites, remain the second most important biological problem for U. S. beekeepers. However, tracheal mite problems are diminished, in part since the unit's staff has discovered genetic resistance to tracheal mites in specific stocks of honey bees and released these stocks to the industry.

Major Accomplishments: Varroa mites-- a) A stock of varroa resistant Russian honey bees have been imported, tested and released to industry. b) A line of honey bees has been selected that is resistant to varroa mites. c) Genetic variation of varroa mites was discovered which matches reports of reduced varroa problems. Brazil's lack of varroa problems is related to the Japanese strain of varroa mites found there, not the strains of bees. d) Queens from colonies that have survived an unusually long period of time without treatment for varroa have been evaluated for resistance to varroa. None have shown exceptional resistance to varroa, indicating that most of this type of colony survive because of chance environmental circumstances rather than genetic resistance. e) Ways to interpret measures of varroa infestation developed. The best method is to evaluate the total numbers of mites in a colony since an array of factors diminishes the value of other measures. f) Standardized field evaluation procedures of honey bees and varroa mites have been developed which permit the precise evaluation of mite population growth and the specific factors that diminish mite population growth. g) Optimum timing was determined for Apistan treatments to control varroa. Winter and early spring treatments were not effective in slowing late spring mite population growths. To be effective, early season treatments must be given in late spring. h) One mechanism of resistance of bees to *Varroa jacobsoni* was determined to be their ability to cause infesting varroa to not reproduce. i) The temperatures required to kill varroa and tracheal mites were

determined. This knowledge could be used to produce mite-free packages of bees and queens. j) The conditions that permitted varroa to survive 5 days without a living host were determined. This knowledge permits the accidental spread of Varroa through materials not containing bees to be controlled. k) A bioassay for a varroa-resistance trait (suppression of mite reproduction) was developed which can be used to select for honey bees that resist Varroa. l) A marking technique for studying the activities of varroa was developed . m) Varroa, fluvalinate and formic acid were determined to kill or otherwise diminish the reproductive potential of drone honey bees. **Tracheal mites**--a) ARS-Y-C-1 stock resistant to tracheal mites was released. b) Buckfast stock resistant to tracheal mites was released. **Other honey bee mites**-- a) A new species of varroa was identified. b). Survival characteristics of the honey bee parasitic mite *Tropilaelaps clareae* were determined. These characteristics indicate that this mite has the potential to reach the U. S. and become a serious pest. **Africanized honey bees**-- a) Identification tools for Africanized honey bees were developed. These tools are the international standard used to identify Africanized honey bees. b) The hybrid nature of Africanized honey bees was discovered. c) Africanized honey bees were documented to be susceptible to diseases and pests. d) Drone flooding was found to control mating in an Africanized honey bee area. e) The overwintering potential of Africanized bees was determined. f) European honey bees were found to have the "African" mitochondrial type. g) Guidelines were developed for the abatement of nuisance honey bees on public lands. **Honey Bee Genetics**-- a) The numbers of honey bee queen matings were determined with DNA analysis. b) Honey bee polymorphic microsatellite loci were described. c) Multiple mating in honey bees was found to underlie colony fitness. d) Honey bee specific RFLP DNA markers were developed.

Future Directions: For the foreseeable future, we will continue our work on breeding honey bees resistant to varroa and tracheal mites. The program with Russian honey bees has entered a new phase. The existing stocks and newly imported stocks will be selected to further improve varroa and tracheal mite resistance as well as other commercially valuable traits with the goal of producing a highly desirable mite resistant stock that can be productively used without the aid of any acaricides. The underlying traits of resistance will be determined for Russian honey bees and molecular genetics will be employed with the goal of producing marker assisted breeding for mite resistance in Russian and other stock. The program of trait evaluation for the commercial breeding of bees with improved tracheal mite resistance will continue.

BREEDING AND GENETIC APPROACHES TO TRACHEAL MITES, AFRICANIZED BEES, AND HONEY BEE STOCK IMPROVEMENT

Project: 6413-21000-006-00D

Location: Baton Rouge, Louisiana

Researchers: H. A. Sylvester
Robert G. Danka
Thomas E. Rinderer
John R. Harbo

Net to Loc: $743,943

Objectives:

(1) Find or breed and develop techniques to produce honey bees showing resistance or tolerance to tracheal mites.

(2) Minimize the effects of Africanized honey bees, principally through genetic techniques

(3) Devise novel approaches (including molecular techniques, germplasm storage, mating control, requeening and apiary management) to facilitate breeding and managing honey bees having improved abilities in pollination, honey production, and bee and queen production.

Approach:

Evaluate domestic and foreign bee stocks for resistance to tracheal mites using both colony level tests and large-scale field tests; identify the mechanisms, genetics and genes underlying tracheal mite resistance; improve Africanized bee identification using novel DNA RFLP probes; assess the micropopulation genetics of Africanized bees in the southcentral United States using newly available DNA microsatellite techniques, and apply new knowledge to enhancing control strategies; measure the relative susceptibility of Africanized bees to tracheal mites; develop traditional and non-toxicant methods of eliminating pestiferous bee colonies; evaluate swarm traps for controlling localized bee populations in critical areas such as parks; characterize honey bee species, subspecies and subspecific hybrids of social bees worldwide using DNA RFLPs and microsatellites; clarify honey bee reproductive biology by using improved DNA ID methods, find novel physical and biological agents for controlling wax moths; determine pollination requirements of selected crops.

CONTROL OF THE HONEY BEE PARASITE,VARROA JACOBSONI THROUGH BREEDING AND NOVEL METHODS OF MANAGEMENT

Project: 6413-21000-007-00D

Location: Baton Rouge, Louisiana

Researchers: John R. Harbo
Robert G. Danka
Jeffrey Harris
Thomas E. Rinderer

Net to Loc: $524,225

Objectives:

(1) Develop and conduct multi-state field trials of Russian honey bees and bees that suppress mite reproduction in collaboration with commercial beekeepers, and release resistant stock to bee breeders.

(2) Evaluate other reports of Varroa resistant stock, for foreign bees, develop local data, and import and test stocks as appropriate.

(3) Identify genetic differences in varroa mites that are known to differ in their virulence.

(4) Identify genetic characters of bees that impart resistance against varroa mites.

Approach:

Field trials will evaluate population of bees and mites and other economic characters such as honey production throughout the active bee season. Parents for stock propagation and possible release will be selected based on these evaluations. Methods for foreign trials will be similar to domestic methods. Measure the biodiversity of Varroa jacobsoni worldwide with morphometrics and molecular techniques. Describe ecotypes that express genetic differences and identify those that possess the potential to alter virulence.

BEE BIOLOGY & SYSTEMATICS LABORATORY
Logan, Utah

Mission: The Bee Biology & Systematics Laboratory (BBSL) is working to expand the pollinator portfolio for U.S. Agriculture. We conduct research on wild bees as crop pollinators, the population dynamics of bees and their natural enemies, plant-pollination systems, bee systematics, and the development of management systems for bee populations. Early-flowering orchard crops, cross-pollinated crops not effectively pollinated by honey bees, and Threatened & Endangered (T&E) plant species have been targeted for emphasis.

Problems Being Investigated: 1) Improving management of the alfalfa leafcutting bee, *Megachile rotundata*, for commercial production of alfalfa seed; 2) Delivering the blue orchard bee, *Osmia lignaria*, for pollinating orchard crops; 3) Improving the pollination of new or traditional crops by designing and implementing strategies to manage native bees as pollinators; 4) Characterizing the pollination needs of T&E plants; 5) Pursuing conservation and stewardship plans for native pollinators; and 6) Expanding biogeographical studies of the bee faunas from North and Central America.

Major Accomplishments: We have demonstrated the effectiveness of the blue orchard bee (*Osmia lignaria*) as a pollinator of orchard crops and are now focusing on rearing techniques and on demonstrating the sustainability of the blue orchard bee used at a commercial scale on apples, cherries, and almonds. We have shown that the one sunflower leafcutting bee (*Megachile pugnata*) is as efficient as ten honeybees in pollinating hybrid sunflowers in large field cages and we are developing rearing methods which will enable us to improve the synchrony of emerging adults with sunflower bloom. We have identified the bee fauna that visits flowering cranberries, have compared individual pollination efficiencies of the common species, and have demonstrated that a heritable attribute of honey bee foraging behavior can be used to improve their efficacy as a cranberry pollinator. We have provided management agencies like the USFWS, BLM, NPS, USFS, and APHIS with pollination systems research for more than 30 T&E plant species. We maintain The U. S. National Pollinating Insects Collection, with an estimated one million specimens, as a major repository of pollinating bees and aculeate wasps from around the world. We have developed a specimen-level database to make the wealth of biological and distributional information, which this collection represents, more readily accessible.

Future Directions: We are conducting research and demonstration efforts to establish optimal levels of pollination and seed-set that may be accomplished with fewer alfalfa leafcutting bees through improved timing of bee establishment with alfalfa bloom. An ongoing parallel project emphasizes the effect of rearing temperatures on development, emergence, diapause induction and second-generation rates in alfalfa leafcutting bees reared at different temperatures. We have recently established three new Cooperative Research and Development Agreements (CRADAs) with International Pollination Systems, USA to deliver the blue orchard bee management system to California almond

producers, with Ocean Spray Cranberries, Inc. to explore wild bee pollination and management in commercial cranberry systems, and with the Xerces Society to use selected portions of golf courses as pollinator conservation reserve areas. Through a Memorandum of Understanding (MOU) with the Kendell Orchard, we will develop a 'small farm' blue orchard bee management system for sweet cherry pollination.

BIOLOGY AND DEVELOPMENT OF ALTERNATIVE CROP POLLINATORS

Project: 5428-21000-008-00D

Location: Logan, Utah

Researchers: William Kemp
Vincent Tepedino
James H. Cane
Terry L. Griswold

Net to Loc: $898,773

Objectives:

(1) Determine level of candidacy of native non-Apis bees as pollinators of major crops.

(2) Characterize the biology, behavior and systematics of non-Apis bees which have high potential for use as alternative pollinators.

(3) Develop effective management systems for commercial use of non-Apis bees as effective pollinators of major agricultural crops.

(4) Develop control methods for targeted diseases and pests of non-Apis bees.

Approach:

Study the biology of non-Apis bees to determine their candidacy as pollinators of agricultural crops. Develop methods to obtain large populations of candidate pollinator species and then develop management programs that will sustain pollinators species within agricultural environments. Study diseases, arthropod nest depredators, and negative environmental factors to develop methods of control and increase survivorship of bee species. Determine pollination requirements of targeted crops (including forage, vegetable, oil, orchard, greenhouse, field-cage) and expand numbers of crops pollinated by bees already managed as pollinators. Determine importance of pheromones in developing management systems of pollinator species. Continue studies on pollination requirements of selected threatened and endangered species. Complete catalog of osmiine bees and systematic studies on other Megachilidae. Conduct bee faunal studies in selected geographic regions. Conduct research in cooperation with university Ag. Experiment Stations.

CARL HAYDEN BEE RESEARCH CENTER
Tucson, Arizona

Mission: The mission of the Carl Hayden Bee Research Center is to advance the productivity of Agriculture by conducting basic and applied research aimed at optimizing crop yields through application of improved pollinator systems. Honey bees, native bees and other pollen vectors, or strategies for achieving optimal pollination are investigated to develop new methods and technologies for efficient pollination. New knowledge is integrated into sustainable agricultural systems. Where pollination is being impacted by environmental change, such as the incursion of parasitic mites, pests, or disease, or the process of Africanization of honey bee colonies, research emphasis is placed on strengthening the beekeeping industry and ensuring the pollination of crop and non-crop plants.

Problems Being Investigated: The Center has been assigned lead responsibility for Crop Pollination and AHB research. The current research program addresses problems related to colony viability and crop pollination, and on mitigating the impact of Africanized honey bees on beekeeping and the general public.
Colony Viability and Crop Pollination. The Center is engaged in research to develop an Integrated Pest Management (IPM) program for Varroa which will eliminate the use of pesticides and maintain Varroa infestations below 5%. This work involves the development of Varroa-tolerant bees combined with studies of the population dynamics of Varroa in honey bee colonies, and the search for alternative miticidal compounds which are environmentally friendly, safe, effective, inexpensive, and minimize the development of resistant mites. Aspects of the biology of wax moths, and small hive beetles are similarly being studied. Repercussions of concurrent foraging of honey bees and non-*Apis* bees in hybrid seed crops are being investigated. Systems are being developed for producing bumble bees, mason bees, and carpenter bees for commercial pollination in orchards and greenhouses.
Africanized Honey Bees. The Center has taken a multi-tiered approach to mitigating the enormous impact of AHB on the general public, and on the beekeeping industry. The work involves public education regarding feral colonies, the development of repellents to prevent bees from moving into cavities and to stop mass attacks by bees, and mitigating the impact of AHB on pets and livestock. Research is also directed at the production of European queens and the management of domestic colonies in AHB areas, and developing simple, expedient and cost effective ways of requeening.

Major Accomplishments: Colony Viability and Pollination. A cornerstone of the Varroa IPM program has been completed - that of demonstrating that beekeepers can develop Varroa-tolerant bee populations out of domestic stock. A ~65 colony population has survived for 5 years with a mean level of infestation below 8%, and produced an average of 90 pounds of honey per colony in 1998. Expansion of this technology to a 700 colony commercial beekeeping operation will be completed in 1999. Nine highly effective miticidal natural products have been identified. We have found viruses within white tyrosine nodules found in the abdomens of bees parasitized by Varroa. The

nodules appear to be produced as an immune response to mite feeding. We demonstrated that when honey bees and non-*Apis* bees forage together on male-sterile sunflowers, the pollen on the bodies of honey bees increased resulting in improved seed set. Our research demonstrated that carpenter bees can pollinate tomatoes in greenhouses and that mason bee populations can be increased near cultivated stands of *Phacelia*, a wild flower. The importance of mixed bee forage, that is mixed sources of pollen, for bee health and productivity was demonstrated. This knowledge forms a basis for better bee management to maintain vigorous colonies.

Africanized Honey Bees. Programs already completed and in use include the development of emergency strategies for rescuing victims of mass attacks, comprehensive AHB educational materials, videos on how to safely remove honey bee swarms and colonies and prevent recolonization, a trapping system to remove swarms before they can become problem colonies, and an information transfer program for the general public, doctors, veterinarians, and beekeepers on how to deal with multiple stinging events. During supersedure, daughter queens from Africanized patrilines were found to emerge first and become the new queens. This knowledge provides new insight on the precise mechanisms that lead to Africanization of managed colonies and how to prevent it. Also, discovered was that the inheritance of defensive behavior is via the drones, hence, requeening AHB colonies with virgin European queens in AHB areas will not reduce defensive behavior in colonies. Swarm traps were developed to attract swarms so they could be added to apiaries, or, in the case of Africanized bees, destroyed. They now form the only effective means to pro-actively protect communities, schools, and recreational areas from colonization by AHB.

Future Directions: Colony Viability and Pollination. Requeening of a 700 colony commercial beekeeping operation with Varroa-tolerant program queens will be completed in 1999, evaluation will follow. We will begin development of an "Area-wide"Varroa IPM program in FY 2000. Evaluation of Varroa-tolerant bees together with other colony management strategies is underway. The evaluation of essential oils identified as miticides and the development of delivery systems will continue. Anti-microbial actions of the oils will also be tested: Our objective is to develop a product that will control Varroa mites and brood diseases. The chemical ecology of Varroa will be studied to develop other innovative techniques for mite control. Studies to determine the nature of the tyrosine mediated bee immune response to Varroa parasitism will continue. Nutritional factors that enhance bee feeding and delivery of antibiotics will be identified. We will continue to examine how pollination might be enhanced through the foraging interactions between honey bees and non-*Apis* bees. Exploratory studies to develop techniques to efficiently direct bees to target crops to maximize pollination and reduce drifting by *Apis* and non-*Apis* bees in orchards, fields and in greenhouses are planned. Studies to develop integrated control systems for wax moths, and small hive beetles will be continued.

Africanized Honey Bees. Sperm usage by queens is a fundamental biological attribute that must be defined if the Africanization process is to be understood and managed. We will set up a study to determine how African and European sperm are used by African and European queens: In earlier studies we found a predominance of African patriline workers in colonies headed by queens mated to European and African drones. Work

utilizing state of the art technologies to develop simple, expedient and cost effective ways of finding and removing old queens and introducing new queens will continue as will the development of repellents to prevent bees from moving into cavities and to stop mass attacks by bees.

IMPROVEMENT OF BEE POLLINATION OF CROPS AND ECOLOGICALLY IMPORTANT PLANTS

Project: 5342-21000-010-00D

Location: Tucson, Arizona

Researchers: Gloria D. Hoffman
Justin O. Schmidt
Stephen L. Buchmann
Eric H. Erickson, Jr
Hayward G. Spangler

Net to Loc: $829,116

Objectives:

Improve quality and quantity of pollinators by developing strategies to reduce impact of bee diseases, parasties, wax moths, and pesticides.

(1) Determine means by which honey bees obtain compatible pollen and cross pollinate crops.

(2) Evaluate impact of biotic and abiotic factors on pollinating efficiency of bees.

(3) Develop management schemes for non-Apis bees in greenhouses and agroecosystems.

(4) Construct and validate pollination and fruit set prediction models.

Approach:

The overall objective of this CRIS research is to maximize initial set in bee-pollinated crops under the biotic and abiotic conditions at a given year and site. This will be accomplished by: 1) maintaining strong populous colonies for pollination, 2) obtaining a better understanding of the means by which pollen is transferred between flowers of specific crop species and the biotic and abiotic factors affecting the rate of pollen transfer, 3) developing management strategies for using non-Apis pollinators, and 4) integrating the information obtained in the first three objectives into computer simulation models to define the interactions of biotic and abiotic factors that culminate in pollination and seed/fruit set and to guide pollination management decisions. Permethrin used as a bee repellent when mixed with other pesticides will be evaluated for efficacy in reducing honey bee mortality. Non-chemical controls for parasitic mites based on fundamental mite biology will be developed.

BIOLOGY & POPULATION DYNAMICS OF AFRICANIZED AND THEIR INTERACTION WITH DOMESTIC & FERAL HONEY BEES

Project: 5342-21000-011-00D

Location: Tucson, Arizona

Researchers: Justin O. Schmidt
Gloria D. Hoffman
Stephen L. Buchmann
Eric H. Erickson, Jr
Hayward G. Spangler

Net to Loc: $333,960

Objectives:

(1) Characterize the biology, behavior, and population dynamics of Africanized honey bees and their interactions with European bees, mites, and bee diseases.

(2) Determine the risks and benefits of Africanized honey bees and develop technologies to exploit desirable characteristics of managed and feral bees and promote public safety.

Approach:

Seasonal and locational activities of feral Africanized bees and their population dynamics relative to colony survival and resistance to Varroa and tracheal mites will be monitored in specific sites, models of population and genetic influences on Africanized bee survival and competition with domestic and feral European bees will be tested. Defensive behaviors and patterns of Africanized bees will be analyzed and passive and active methods for controlling the bees and their attacks will be developed. Repellents and controls for attacking bees will be tested. Methods of handling emergency stinging attacks will be developed and the techniques transferred. The mechanisms of resistance to diseases and parasites of Africanized and domestic bees will be determined.

HONEY BEE GROUP, BENEFICIAL INSECTS RESEARCH UNIT
THE KIKA DE LA GARZA SUBTROPICAL AGRICULTURAL RESEARCH CENTER
Weslaco, Texas

Mission: Honey bee research is conducted within the ARS Beneficial Insects Research Unit. Unit scientists conduct applied research on effective ways of controlling insects and parasitic mites that attack honey bees. Specific objectives; 1) test and develop safe chemical and biological methods to control *Acarapis woodi*, *Varroa jacobsoni,* and *Aethina tumida*, 2) study the biology, behavior, reproduction, odor attraction and control of the small hive beetle, 3) determine the nature of the relationships between Africanized honey bees, European bees and parasitic mites, and 4) determine the stress factors on bees involved in migratory pollination.

Problems Being Investigated: Damage due to the varroa mite, *Varroa jacobsoni*, has increased, due to widespread fluvalinate resistance throughout the U.S. We continue to search for alternative chemical control for both varroa and the small hive beetle. The small hive beetle, *Aethina tumida*, has become a serious threat to U.S. beekeeping, particularly in the southeastern areas of the country. Questions on basic biology and control of this pest are being examined. Africanized honey bee studies focus on the process of Africanization in subtropical Texas and NE Mexican honey bee populations and the interaction with varroa and their putative resistance to it.

Major Accomplishments: Provided state departments of agriculture with information necessary for Section 18 approval of coumaphos strips for controlling varroa mites and the small hive beetle. Developed data on cymiazole (Apitol) necessary for section 18 registration. Invented a hive entrance insert for improved varroa control. Demonstrated fluvalinate resistance in varroa to be an unstable trait, implying that fluvalinate may be successfully used on previously resistant populations after an interval of non-use. Discovered several botanicals with acaricidal properties. Clarified aspects of small hive beetle biology, including flight times, diurnal sex ratio patterns and feeding on hive products and fruit. Examined the efficiency of trapping positions within the hive for small hive beetle. Demonstrated control using several insecticidal tactics, including soil drenches, in-colony treatments, and fumigations for small hive beetle. Monitored the initial dispersal of Africanized honey bees into NE Mexico and southern Texas. Documented the role of varroa in the disappearance of a feral European honey bee population.

Future Directions: Continue testing chemicals (synthetic and natural) for mite and beetle control. Conduct a comprehensive survey of small hive beetle biology, behavior, damage and control in South Africa. Continue providing data to various states to obtain a renewal of coumaphos strips under Section 18 approval. Cooperative programs will examine the differences in varroa resistance between Africanized and European genotypes. Cooperative research will be conducted studying the mechanism of fluvalinate resistance in varroa. Continue investigating the basic biology of the small

hive beetle, including antennas receptor ultrastructure, and alternative controls of this pest. Determine if hygienic bees are resistant to small hive beetles. Measure performance levels of pollinating colonies that have been stressed.

PARASITIC MITE CONTROL IN HONEY BEE COLONIES UTILIZED IN HONEY PRODUCTION AND CROP POLLINATION

Project: 6204-21000-007-00D

Location: Weslaco, Texas

Researchers: William T. Wilson
Frank A. Eischen
William L. Rubink
Patti J. Elzen
Vacant

Net to Loc: $1,174,460

Objectives:

(1) Characterize fluvalinate resistance and study dispersal of resistant Varroa.

(2) Isolate and evaluate natural products for control of honey bee mites.

(3) Test miticides and treatment methods that support cost-effective bee management.

(4) Develop knowledge on biology and ecology of parasitic mites in areas dominated by Africanized bees.

(5) Develop strategies to mitigate stress factors in queen bee survival.

(6) Develop biorational control strategies for Aethina tumida.

Approach:

Utilize toxicological methods and mite drop in honey bee colonies to determine the presence and distribution of fluvalinate-resistant Varroa. Isolate varroacidal properties of smoke from natural products using GC separation and bioassay. Field test new miticides in bee colonies in U.S., Mexico and Guatemala. Use GLP-collected efficacy and residue data to support registration of new control products. Study mite biology and ecology within hives to identify traits that increase miticide effectiveness. Measure mite impact on honeybees pollinating crops and honey production in feral and managed colonies, whether Africanized or European. Study mite-related factors and stress in migratory bee colonies that contribute to population decline. Develop insecticides and attractants to monitor and control the small hive beetle in hives and in soil. Study biocontrol agents from A. tumida in U.S. and Africa. Determine the role of fruit in beetle survival and reproduction.

Customers and Stakeholder

Priority Statements

AMERICAN BEE JOURNAL

The Beekeeper's Companion Since 1861

51 South Second St.
Hamilton, IL 62341
(217) 847-3324

Dear Amy Odegaard, program analyst,
Here are a few items of concern to beekeepers that have been related to me through our publication, the American Bee Journal.

1. Beekeepers want less toxic and more reliable ways to control tracheal and varroa mites. They want to control mite populations without contaminating their beehive products or harming their bees.

2. Beekeepers are worried about American foulbrood becoming resistant to our standard treatment, Terramycin. They would like to see alternatives approved for use against both AFB and EFB.

3. Many readers tell me they like it best when USDA research entomologists relate their findings in less technical papers submitted to the trade magazines. They often cannot understand the more technical papers. This presents a problem because the researcher is often not taken seriously unless he submits a scientific paper to a peer-reviewed and recognized academic journal. On the other hand, his research is often never read by the people he needs to reach the most, the beekeepers. That's why I think that whenever possible, the researchers should also submit a popular article or summary of their research for beekeepers.

4. Many beekeepers would like the USDA beekeeping labs to spend more time on applied research that can readily be used by the beekeeping industry. In particular, I have often heard beekeepers say they would like to see the bee labs do more practical research on beekeeping management--better honey production, better wintering methods, more efficient honey handling and extracting, better designs for beehives and beehive equipment, as well as honey house equipment. This type of research used to be done at the bee labs, but it is rarely seen today.

Best regards,
Joe Graham, editor
American Bee Journal

Apiary Inspectors of America

Maryland Department of Agriculture
50 Harry S. Truman Parkway
Annapolis, MD 21401
voice (410) 841-5920
fax (410) 841-5835
e-mail smithib@mda.state.md.us
October 29, 1999

Critical issues that should be addressed by the ARS Crop Production Research Program: Bees and Pollination Component.

1. **Maintaining Honey Bee Colony Health**

The number of managed honey bee colonies in the US has significantly declined in the past 10 years because of diseases and mite infestations. ARS and state universities have contributed significantly to the knowledge of mites and bee diseases during this time period. Their work has supported the EPA labeling of effective chemicals for the control of mites, especially varroa. In spite of this effort, beekeepers continue to report bee colony losses from 10 to 60 percent annually. A 1998 survey conducted by the Washington State Department of Agriculture Apiary Program revealed that beekeepers maintain their minimum number of colonies by making purchases of queens, packaged bees, nucs, and hives of bees equal to 35 percent of their minimum number of hives. These data suggests that in spite of the availability of miticides, significant colony health issues remain and are causing or contributing to the continuing high losses of bee colonies in the US. **Beekeepers need more cost effective mite and disease control systems to support colony health.**

The bee disease American foulbrood is becoming resistant to the antibiotic oxytetracyline; resistant/tolerant strains have been identified in several states. **Beekeepers need an effective antibiotic for treatment of oxytetracycline resistant AFB.** Actually they needed it yesterday. We are starting to see major impacts from AFB on the beekeeping industry far beyond anything in recent decades due to the development of antibiotic resistance in the AFB bacterium.

The small hive beetle is the newest introduced pest of honey bee colonies. There are many unanswered questions about the biology and control of this beetle. **Research is needed regarding the control of small hive beetle in honey bee colonies, packaged bees and the honey house.**

2. **Effective Production Methods**

Beekeepers need to increase the income produced per colony while at the same time reducing the input costs per hive. The major factor crushing the industry is low honey prices which results in a low income per colony generated. We are starting to see some shake out in the commercial industry at present and it will get much worse if the economics don't turn around soon. Pollination fees are also being cut as more colonies are being pushed for pollination contracts so both ends of the income producing cycle are under attack. Better management systems that will increase production per hive are one key to dealing with this as well as better harvesting systems that will reduce the labor needed. **More effective production methods for both pollination and honey production are needed.**

3. **Genetic Improvement of bees**

USDA's current effort on stock improvement is commendable and worthy of continuation. However, previous work by ARS identified the narrow genetic base of US honey bee lines. **A strategy is needed and should be implemented to diversify the gene pool of the US as a whole by the distribution of new genetic material to all commercial queen breeders and monitoring the success of the diversification over time.** Changes to stock introduction protocols are currently being considered by USDA. It is hoped that these changes will enhance the partnering between universities and ARS to enhance stock quality and genetic diversity in the short term, and provide for a clearing house for stock introductions, evaluation, and development.

4. **Bloom Attractiveness to Honey Bees**

It is important and necessary to document bloom attractiveness of agricultural crops to ensure and promote sustainable agricultural production systems and pollination efficiency. In the 1970s, Dr. Carl Johansen conducted studies of the sugar content and nectar production of apple and pollinator varieties in Washington State. Since that time many new varieties of tree fruits have been developed for use in production agriculture. Dr. Justin O. Schmidt, ARS, recently conducted studies of the nutritional mix and attractiveness of native pollens to honey bees. However, work is needed to assemble data on the attractiveness of nectar and pollen of agricultural crop species and varieties to honey bees. The data would aid crop scientists in their selection of genetic lines that will enhance the sustainability of agricultural production and organic farming, growers in their selection of profitable varieties, and beekeepers in their effort to enhance agricultural pollination.

Crop bloom attractiveness is particularly desirable in the northern states and in those years when cool weather limits the foraging ability of honey bees to an hour or two during two or three successive pollination days. Crop density, quality, and seed set per acre are indispensable to the economic bottom line of the grower. Bloom attractiveness may be the lone issue between economic crop production and economic loss in the current business climate of American farming. It may be desirable to breed honey bees and/or develop strategies to improve the pollination of crops with reduced bloom attractiveness by honey bees.

From: "Diane" <bluebee@ainet.com>
To: NPS.PONPS(KSN)
Date: Mon, Nov 8, 1999 11:46 PM
Subject: Bees & Pollination Workshop

Dr. Karl S. Narang, National Program Leader
USDA-REE-ARS-NPS-APPV&S
Medical and Veterinary Entomology
5601 Sunnyside Avenue
Beltsvill, MD 20705-5138

Dear Dr. Narang

As requested by Bill Kemp, please find attached my recommendation relating to this workshop.

While almonds are not the primary source of my income, my concerns are representative of most almond growers in the valley especially in view of the current year decline in prices. I want every last almond flower to be pollinated.

First I need to let you know that I do not pretend to be an expert on almonds or BOBs. I bought the ranch two years ago and my wife and I both have full time jobs. I have had one almond crop where a portion of the orchard which has approximately 9 acres was exposed to BOBs.

I believe there is an urgent need for a best practices manual for Osmia lignaria (BOBs). The manual should be written in lay text in order to be understood by growers and be posted on the Internet with yearly updates.

A visual observation of BOBs pollinating my blooms last year noted that when BOBs returned to the nest after foraging, it looked like a yellow paint brush was applied to their underside. My neighbor who is a full time farmer, after observing them for a short period of time, stated that he wanted the BOBs in every sq. ft. of his adjacent orchard next year and told me to let him know how much it would cost. The Land Manager Contractor (LMC) who harvests the nuts, looked at a BOB pollen ball and stated "It smells like honey. That is a lot of pollen. I want to try the bees next year" These are just two examples of producers who had immediate interest based on direct observation.

The bottom line is that in 1999, I had approximately 5,000 pollen balls (most developed into BOBs) that resulted in pollination that was performed by BOBs. I do not know what the increase in yield attributable to BOBs was for this year, and do not have comparable crop production for past years, as I replanted the back 9 acres to new trees, and the ranch production for the past five years is based on 18 acres. Not withstanding the above, I plan to use BOBs on the entire orchard next year (nine acres) and have agreed to furnish bees to the neighbor who has 5 year leaf hedge rows trees on the adjoining field (4 and a half acres). The start up cost is considerable, but now having established a resident population, I plan on maximizing pollination using BOBs and honey bees on a go-forward basis.

Vendors that I purchased the bees from were unable to provide much help related to almond pollination. One vendor stated if I was able to obtain 85% reproduction of bees purchased, I would be very successful.

It is my opinion that BOBs will be used extensively for almond production by the year 2010 along with honey bees. This will be a shift in perception that will be accelerated if a best practices manual is available.

The use of BOBs to enhance almond production is coming. It is just a matter of how rapidly it occurs and the government can be in a position, with minimal effort to take credit for this by publishing a manual on

how to manage this bee.

I can be reached at 219-341-3239 (work number) should you have any questions.

John Brandeberry

CC: INTERNET.USU(wkemp)

Gene Brandi Apiaries

15346 S. Johnson Road
Los Banos, CA 93635
(209) 826-2881 • Fax (209) 826-1881

October 26, 1999

Ms. Amy Odegaard
Program Analyst
USDA-ARS

Dear Ms. Odegaard:

I appreciate the opportunity to submit a short list of serious concerns that the bee industry is facing at this time. These are listed in no particular order of importance, and should not be considered a complete list of our problems by any means.

1. The need for long term solutions to deal with parasitic mites and the various diseases for which they appear to be a vector.

2. The need for accurate data on the potential adverse effects of pesticides to bees. The only person currently conducting significant research in this area, Dr. Dan Mayer, may be retiring soon and someone needs to continue this research.

3. New antibiotics are needed for American foulbrood control since there are reports by beekeepers in some areas of the country that terramycin is no longer providing adequate control.

4. A long term control of chalkbrood is needed since many beekeepers are reporting 25-50% incidence in their colonies at certain times of the year and there are no viable methods of control at this time.

5. A chemist is needed to conduct primary research on honey.

Sincerely,

Gene Brandi

GOOD AS GOLD
HONEY BEE COMPANY
3212 Aldino Road • Churchville, MD 21028-1818
410-734-4188 • dnssimmons@hotmail.com

October 29, 1999

Dr. S. Karl Narang
National Program Leader
Medical and Veterinary Entomology
5601 Sunnyside Avenue
Beltsville, MD 20705-5138

Drs. Narang and Shimanuki:

I look forward to participating in the ARS National Program Workshop on Bees and Pollination. Here are some of the most critical issues I believe should be addressed by the ARS Crop Production Research Program:

(1) **Development of the tools necessary for a rational, sustainable, integrated management program for mites.** Minimizing the use of chemical miticides will reduce the pressure for development of chemical-tolerant mites, reduce the risk of handling hazardous materials, reduce the risk (or perceived risk) of contaminating hive products, and perhaps, reduce costs. Research is needed to provide (a) quick and efficient methods for monitoring mite loads, (b) treatment thresholds which are geographically and temporally dependent, (c) mite resistant strains of bees, (d) non-chemical, but practical, methods for reducing mite loads, and (e) alternative miticides with the least possible risks to bees, beekeepers and the consuming public.

(2) **Development of alternatives for controlling the Small Hive Beetle and minimizing its spread into non-infested areas.** Research is needed to provide (a) a non-organophosphate treatment, (b) methods to minimize dissemination of infested packages of bees and (c) better understanding of the flight range of beetles and survival outside the hive.

(3) **Development of alternatives for controlling American Foulbrood disease.** The appearance of Terramycin® tolerant populations of *Bacillus larvae* is a real threat to beekeeping. Research is needed to provide alternative controls which are economical and will not contaminate the hive.

(4) **Development of information regarding viruses in the hive.** Research is needed regarding interactions between mites and viruses, the role that viruses play in Bee Parasitic Mite Syndrome and the potential (if necessary) for controlling viral populations.

I look forward to discussing these and other subjects at the Workshop in November.

Sincerely,

Dave Simmons

Dave Simmons
Owner, Good as Gold Honey Bee Company
President, Maryland State Beekeepers Association
Co-chair, Mid-Atlantic Apiculture Research and Extension Consortium Working Group

AMERICAN BEE JOURNAL

The Beekeeper's Companion Since 1861

51 South Second St.
Hamilton, IL 62341
(217) 847-3324

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Best regards,
Joe Graham, editor
American Bee Journal

HARVEY'S HONEY
912 ROUTE 40
MONROEVILLE, NJ 08343
(856) 358-1010 FAX 358-1166

MORE EFFECTIVE SHB TREATMENT BEFORE COLONIES ARE MOVED INTERSTATE OR INTO POLLINATION.
OR - ANSWER THE BURNING QUESTIONS OUR GROWERS HAVE SUCH AS - WILL SHB AFFECT BUMBLEBEE POPULATIONS? - WILL SHB AFFECT CROPS IF BEETLES STAY WHEN COLONIES ARE REMOVED?

DEVELOP A NON CHEMICAL TREATMENT FOR VARROA SUCH AS HEAT - OR RESISTANT BEES WHICH ARE PRODUCTIVE AND MANAGEABLE.

AFB IS BECOMING A LARGER PROBLEM DUE TO STRAINS RESISTANT TO TM. WE NEED ANOTHER TREATMENT TO ALTERNATE.

SOLVE THE NUTRITIONAL PROBLEMS IN THE CRANBERRY - BLUEBERRY GROWING REGIONS (SANDY ACID SOILS) THAT ARE CAUSING REDUCTIONS IN BROOD REARING, SHORTER LIFE SPAN OF WORKERS, AND SEVERE WINTERING PROBLEMS. (SINCE ARRIVAL OF TRACHEAL MITES WINTERING IS IMPOSSIBLE AND ALL MAJOR POLLINATORS WINTER IN THE SOUTH)
WOULD A POLLEN SUBSTITUTE IN THE HIVE AFFECT BEE ACTIVITY ON THE BOGS? WE NEED A SOLUTION TO SUCCESSFUL WINTERING OF COLONIES IN THE NORTH BEFORE AHB ARRIVES IN FLORIDA!

From: Lamar C Kendell <kendelllc@compuserve.com>
To: "Dr. Karl S. Narang" <ksn@ars.usda.gov>
Date: Tue, Nov 9, 1999 1:07 PM
Subject: Bees and Pollination Workshop

Dear Dr. Narang,

Although we had not directly corresponded, I appreciate the opportunity to respond to your request for input on the upcomming workshop. Dr. Kemp speaks well of you and I anticipate meeting you in person.

I must say that I am looking forward to the workshop in general and the opportunity I may have to discuss a little bit about the work and success of the Blue Orchard Bee. I am fully aware of the time and energy it requires to put a sucessful workshop like this together. I personally appreciate all which you have and will do to make it a sucess. Although I am not a entomologist and my perspective with naturally be that of the Orchard Practicioner and user of pollination services, I would be glad to help in any I can.

I was asked to respond by Dr. Kemp. to the concerns and issues I may have for the workshop and any possible recommendations. I t has been my past experience in others areas of scientic research and new ideas development that the overall congeniality of the workshop will go along way to developing the openness and feelings of cooperative learning which is needed in any arena of scientific progress and/or problem solving.

I believe that as the attendees hear new ideas and participate in open candid discussions they will take home with them the most pertinent concepts where they will continue to ponder and apply what was gathered at the workshop. I wonder how the ideas generated and gathered at the workshop may be perpetuated. Might an open Pollination and Bee chat room be appropriate where ideas and concepts gathered at the workshop may be further nutured and developed in the subsequent months following the workshop. I think at least those willing to have their E-mail address published could do so and this could be distributed on the last day.

I personally would hope to see as a result of the workshop, the beginnings of wider acceptance that the Blue Orchard Bee may offer a realistic alternative for commercial pollination of certain crops. That it can be used completely in harmony with the honey bee as a cooperative pollination team.

With Best Regards,

Chet Kendell

CC: Bill Kemp <wkemp@cc.usu.edu>

From: "Tammy Langley" <jlangley@cyberhighway.net>
To: "S. Karl Narang" <ksn@ars.usda.gov>
Date: Sat, Nov 13, 1999 11:33 PM
Subject: Workshop

Dr. Narang,

The topics I will have are:

1. Alfalfa seed industry
2. Research Council
3. Leafcutter bees
4. On site work
5. Additional Scientist

Thank you,
Jim Langley

LOUISIANA DEPARTMENT OF AGRICULTURE & FORESTRY
Office of Agricultural & Environmental Sciences
Pesticides & Environmental Programs
Post Office Box 3596
Baton Rouge, Louisiana
70821-3596

BOB ODOM
COMMISSIONER

MATTHEW J. KEPPINGER, III
ASSISTANT COMMISSIONER

November 2, 1999

Dr. S. Karl Narang, National Program Leader
Medical and Veterinary Entomology
5601 Sunnyside Avenue
Beltsville, Maryland 20705-5138

Dear Dr. Narang:

I regret that I will not be able to attend the Agricultural Research Service (ARS) workshop on *Bees and Pollination* but appreciate the opportunity to comment on the direction of ARS research program activities. As a state regulatory stakeholder most of my comments are related to disease and pest movement and curbing the harmful effects of such movement on an industry that cannot survive without diversification of resources.

In reflecting on 25 years as an apiary inspector I must acknowledge that trying to restrict honey bee disease and pest movement is an impossible task when beekeepers must seek pollination contracts to stay in business. It should be obvious to all agricultural entities that competition among agricultural producers is the highest that it has ever been. Yet government trade policies allow excessive importation of foreign honey resulting in lower prices for our domestic honey. The economics of break-even honey prices at the producer level due to honey surpluses make bee movement a necessity and pest movement a certainty. Such is the so called, "free market economy."

With this in mind, the next great competition within our apiary industry will be pressure from foreign honey bee importations. With honey bee importation comes an increased chance of additional disease and pest introductions. Our recent regulatory track record in dealing with the aftermath of such introductions has not been good and has not been supported by the apiary industry.

Initially, industry and research efforts did not adequately address disease and pest issues. The industry was content to develop its own remedies for disease and pest problems with little regard to problems associated with such unwise practices. ARS, on the other hand, was unfairly asked to provide immediate solutions to these new beekeeping problems and, in some cases, responded well. In other cases ARS was slow to redirect its limited resources toward additional research priorities.

However, overall the changes that have evolved within the ARS honey bee community are positive. Research facilities are more accessible and productive than ever. The ARS relationship with industry is also stronger than ever. To continue in a positive direction I offer the following points as my opinion on how the ARS can best serve its apiary partners.

· A consistent government policy on long term funding of ARS facilities and research would provide stability to research being conducted. Periodic stakeholder review of laboratory accomplishments and failures would prove to be a positive interaction for all participants and possibly provide timely redirection of research priorities and resources. Annual publication of research benefits would be better received than lengthy publication of research data.

· If future honey bee stocks will routinely enter this country from foreign sources, a comprehensive review outlining the entry process must be formulated. Currently the USDA/APHIS allows honey bee stock introductions through approved quarantine facilities but provides no direction or standards to prevent obscure honey bee disease and pest introductions. USDA/APHIS, therefore, has little insight into how honey bee disease and pest exclusion can be accomplished for those applicants awaiting approval to import honey bee stocks for commercial gain. ARS research could contribute to APHIS understanding of honey bee pest risk issues prior to foreign stock introduction. Without this insight the exclusionary policies outlined in the National Honey Bee Act must be maintained.

· Development of effective pest survey tools saves time and money when dealing with pest detection. Also, Integrated Pest Management (IPM) plans are a more appropriate method of dealing with honey bee disease and pest problems once introduction occurs. Research must continue in this area to increase our arsenal of tools that can be incorporated into the regulatory certification process, universally applied across state boundaries. The process must address treatment options (chemical and mechanical), pest resistance issues, equipment handling, etc., for current pest concerns as well as for pests that have not yet entered our borders.

I am encouraged by continued efforts of the ARS to improve services to honey bee stakeholders and hope apiary research continues in a positive direction. Thank you for the opportunity to share my opinions with you and I hope your meeting is productive.

Sincerely,

Jimmy P. Dunkley, Adm. Coordinator
Nursery & Apiary Programs

JPD

SCIENTIFIC AG CO.

OFFICE: 1734 D STREET, SUITE #2
MAILING: P.O. BOX 2141
BAKERSFIELD, CA 93303
(805) 327-2631

September 7, 1999

To: **Amy Odegaard** (Program Analyst, Bees and Polllination)

Fax to: (301) ~~504-4735~~; 1 page (this page) only 504-5467

Re: 3 to 5 most critical issures or problems (Bees & Pollination)
(as per letter of August 27, from S.K. Narang & H. Shimanuki)

In order of importance:

1. Varroa mite control by means other than breeding resistance.
2. Trachael mite control
3. Disease transmission by mites
4. Africanized bees
5. Varroa mite control by breeding resistance.

Sincerely,

Joe Traynor, Owner-Manger
SCIENTIFIC AG CO.

Steve E. Park Apiaries, Inc.
11226 Deschutes Road
Palo Cedro, CA 96073-9740
Tel 530-549-3500, Fax 549-5250

October 7, 1999

Dr. S. Karl Narang
National Program Leader
Medical and Veterinary Entomology
5601 Sunny Ave.
Beltsville, MD 20705-5771

Dear Dr. Narang

As a commercial beekeeper of twenty-five years and operating 7,000 plus colonies in California, Oregon, Washington and Montana each year, I have a great deal of exposure to the variables encountered during each crop year. I have also served on the boards of various regional, state and national beekeeping organizations. These experiences have given me a long-term prospective, which not only guides my own business directions but provides something to give back to a struggling industry.

I will take the opportunity to offer several projects deserving the ARS support to enhance and improve the beekeeping industry:

- Continue the funding of basic biology and behavioral research.
- Develop additional chemical controls to Tracheal and Varroa mites and the Beehive beetle. (Quick fix)
- Develop genetically resistant bees to Tracheal and Varroa mites. (Long term)
- Develop comprehensive pollination "benchmarks" and "standards" for each crop receiving economic benefit from honeybee pollination. Publish the standards in both hard copy and accessible through the Internet for instant grower and beekeeper access.

- Develop an economic study of beekeeper income, which reveals the holistic - relationship between successful pollination and honey production. The study should identify future needs and market characteristics for both income segments.

I appreciate the support and readiness, which the ARS has provided the beekeeping industry in the past, and encourage the Service to continue its support into the future.

Thank you for the opportunity to share my views with you. I regret not being able to attend the workshop on November 19th and 20th. If I can be of any further assistance, please feel free to contact me at anytime.

Respectfully,

Steve Park

Steve E Park
President

CC Thomas E. Rinderer

TEXAS BEEKEEPERS ASSOCIATION

ESTABLISHED 1880

November 3, 1999

Memorandum to: Ms. Amy Odegaard, Program Analysist

Subject: Critical Issues

In response to your request for priority research areas in apiculture and pollination, a concensus among our beekeepers would suggest:

1) chemical controls for varroa and small hive beetle

2) continue research for genetic resistance/tolerance to varroa in honey bee lines with superior traits desired by the beekeeping industry (i.e. honey production, minimal swarming tendencies, gentleness, et. al.)

3) renewed emphasis on pollination requirements - especially on field techniques that assess day by day pollination adequacy (including contribution of native species, honey bee numbers in the field, etc).

4) impact of hive chemicals (particularly miticides) on vigor, reproduction and survivability of queens and drones.

5) Improved techniques for rapidly requeening colonies. Currently, the biggest draw-back to requeening is time required to find and eliminate the old queen. Current techniques require so much time and the success rate is so variable, that many beekeepers simply do not requeen at all or limit requeening to only a portion of the colonies in any given operation.

I referred to the ARS Web Page cited in your (Narang/Shimanuki) letter of August 27. Was hoping to find a listing of current research priorities at each laboratory (honey bee/pollination) and each 5-year plan. I either did not understand the web page linkeage or was unsuccessful in "surfing" the web. Do the above documents exist? Could I get a copy for review prior to the meeting? My fax is 409-845-7029. Thanks.

Regards,

John G. Thomas

805 Vine Street
Bryan, TX 77802
(409) 846-5068 FAX (409)845-7029

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 20192

In Reply Refer To:
Mail Stop 300

OCT 14 1999

Mr. S. Karl Narang
U.S. Department of Agriculture
Agricultural Research Service
5601 Sunnyside Avenue
Beltsville, Maryland 20705-5138

Dear Mr. Narang:

Thank you for your invitation to attend the workshop on Bees and Pollination to be held November 19, 1999. The topic of pollinators is of great interest to the Department of the Interior and the U.S. Geological Survey (USGS), and I regret that I will not be able to attend the workshop.

I have asked Dr. Howard Ginsberg to represent the USGS at the workshop and have sent him copies of your letter and enclosures. As your letter requests, Dr. Ginsberg will identify some important issues regarding bees and pollinators and will submit them and a workshop registration form to Ms. Amy Odegaard. He may be contacted by using the email address howard_ginsberg@usgs.gov or by telephone at (401) 874-4537.

I hope the workshop is productive and look forward to seeing the action plan that is developed.

Sincerely,

Sue Haseltine

for Dennis B. Fenn
Chief Biologist

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Entomology
College of Agricultural, Food, and Environmental Sciences

219 Hodson Hall
1980 Folwell Avenue
St. Paul, MN 55108-6125
612-624-3636
Fax: 612-625-5299

October 12, 1999

Dr. S. Karl Narang
National Program Leader
Medical and Veterinary Entomology
5601 Sunnyside Ave.
Beltsville, Maryland 20705-5771

Dear Dr. Narang,

I am writing to impress on members of the ARS-USDA the urgent need to re-open a national honey bee stock maintenance center, preferably at the USDA Bee Research Lab in Baton Rouge. Below, I outline reasons for this need and offer a suggestion as to how much funding it would require.

Honey bees in the United States continue to suffer from the ill-effects of diseases and parasitic mites. Chemical treatments are available to help control or alleviate the effects of American foulbrood (AFB) disease, varroa mites, and tracheal mites. However, the bacterium that causes AFB has developed resistance to the only antibiotic available to treat the disease in various locations within the US, and varroa mites have developed resistance to fluvalinate, the pesticide used to control the mites within the hive. Many states have received a Section 18 for temporary use of coumaphos, an organophosphate (OP), to control varroa, however the EPA is limiting the use of OP's nationwide due to its demonstrated toxicity to mammals. There is no registered treatment for chalkbrood disease, although many beekeepers claim that their colonies are severely weakened by this fungal disease.

University and USDA laboratories continue to research and develop new products to control diseases and mites. However, within the US, there is only one USDA laboratory and one University research program that are conducting stock selection to breed honey bees that demonstrate resistance to diseases and mite pests: the USDA-ARS Honey Bee Breeding, Genetics, and Physiology Laboratory in Baton Rouge, and the Apiculture Program at the University of Minnesota. At Baton Rouge, two projects are yielding lines of bees with considerable merit. Tom Rinderer and Lillia de Guzman have imported honey bees from Russia that have good resistance to varroa mites. Currently, the Baton Rouge group indicates that the Russian honey bees will only have to treated half the number of times necessary for the control of varroa in domestic colonies. The selection program with Russian honey bees has the goals of further improving resistance to both varroa and tracheal mites. John Harbo, at the same lab, has selected a line of honey bees that only permits a limited reproduction of mites in their colonies. The line is especially useful in transferring genes for resistance to other stocks through outcrossing.

At the University of Minnesota, a line of bees that demonstrate hygienic behavior have been bred. Hygienic behavior confers good resistance to American foulbrood and to chalkbrood, and is one mechanism of defense against varroa mites. Colonies with instrumentally inseminated hygienic queens do not require treatment for AFB or chalkbrood, but still require treatment for varroa mites, although at less frequent intervals.

It is important that beekeepers in the US have disease and mite resistant breeder queens readily available to them. Stock selection is as important as product development in the quest to control diseases and mites in an integrated and sustainable manner. Yet bee breeding and stock maintenance is under-represented and financially under-supported.

The USDA lab in Baton Rouge is the ideal place for such a stock maintenance center. The facility is already established, and bee breeding and stock maintenance are part of the mission of this laboratory. At one time, stock maintenance was done at the laboratory. They released many thousands of queens during the 1950's and 1960's, but the demand for their stocks fell as queen breeders had incorporated the germplasm into their own stocks and no longer needed more material from the lab. Because of the reduced demand and the high cost of stock maintenance, the stock center function of the lab was closed.

To re-open the stock maintenance center, $300,000 in recurring funds would be required. This amount would fund the salaries for one category 3 scientist, with a PhD in bee breeding and genetics or practical knowledge of these areas, and for two technicians to assist with rearing queens, instrumental insemination, and stock evaluation.

If the stock maintenance center was funded, and honey bee stocks were once again maintained in Baton Rouge, I know that they would need to have a distribution system for breeder queens that is fair and equitable. They currently have a Cooperative Research and Development Agreement for the distribution of Russian honey bee queens, but that program includes research as well as breeder queen distribution. Such a program might not be suitable for stocks that are only being maintained. In any event, I am sure that technology transfer specialists in the USDA in collaboration with beekeepers (such as members of the American Beekeeping Federation) can recommend the most appropriate way to distribute breeder queens.

I hope this letter generates interest and discussion about the need for a well-run, high-quality, national stock maintenance center. I would be happy to work with you on this critical project.

Sincerely,

Marla Spivak
Assoc. Professor
University of Minnesota

1785
The University of Georgia

College of Agricultural and Environmental Sciences
Department of Entomology

MEMO TO: Dr. S. Karl Narang, National Program Leader
FROM: Keith S. Delaplane, Associate Professor of Entomology
RE: pollination research priorities
DATE: October 11, 1999

Dr. Tom Rinderer encouraged me to write a letter to you with my suggested research priorities for the ARS national program component on Bees and Pollination. I thank you for this opportunity to participate in the process in lieu of my personal attendance November 19-20. Here follows my suggested priorities.

1. There is need for more updated, research-derived estimates of the economic and environmental impacts of bee pollination. The most-cited estimates (from 1989) of $9 billion largely ignore non-*Apis* bees. A later 1992 estimate included impacts of non-*Apis* bees, but neither addressed the impacts of bee pollination on such non-agricultural arenas as erosion control, wildlife food, and plant conservation.

2. The required density of bee pollinators for most crops needs to be revisited. For the most part we are still citing the 1976 McGregor handbook. There has been much ecological water over the dam since 1976 and I expect that research would show that most bee densities need to be increased.

3. There is abundant ecological literature supporting the notion that bee visitation, and pollination, is enhanced in nectar-rich plants. I believe that there is urgent need for studies to explore the efficacy of selecting for (or engineering) high nectar production in our important bee-pollinated crops. This is especially pertinent to such poor bee forages as tomato, cranberry, pepper, and cucurbits in which pollination often is seen as a limiting factor.

4. There is need for increased research (and extension) dollars for expanding the utility of non-*Apis* pollinators.

Thank you for your consideration of these ideas.

c: Dr. Tom Rinderer
Dr. Dewey Caron

413 Biological Sciences Building • Athens, Georgia 30602-2603 • Telephone (706) 542-2816 • Fax (706) 542-2279

From: <hgi0011u@postoffice.uri.edu>
To: NPS.PONPS(KSN)
Date: Mon, Nov 15, 1999 1:56 PM
Subject: USDA-ARS Bees and Pollination Workshop

15 November 1999

Dr. Karl S. Narang, National Program Leader
USDA-REE-ARS-NPS-APPV&S
Medical and Veterinary Entomology
5601 Sunnyside Avenue
Belstville, MD 20705-5138

Dear Dr. Narang:

William Kemp has asked me to contact you concerning the issues that I wish to emphasize at the upcoming USDA-ARS Bees & Pollination Workshop. I will be representing the U.S. Geological Survey at the workshop, and as you may know, we held a joint USDA/Dept. of Interior meeting on declining pollinators at the ARS Bee Lab in Logan, Utah last May. At that meeting (which included academic and museum scientists, as well USDA and DOI researchers) we identified several areas of mutual interest where we could develop collaborative research programs, or where research by one of the agencies would be beneficial to the other agency. These are the areas I intend to emphasize at the pollination meeting this week. I plan to bring DRAFT copies of the report from the USDA/DOI pollinator meeting to the workshop.

One area of considerable importance is to establish monitoring programs for feral honey bees and selected native bee species. The background level of pollination provided by these bees is undoubtedly important to agriculture, but trends in these bee populations are not known. The value of these wild bees for crop pollination also needs to be assessed. This program can be coupled with a survey of bee diversity along a cline from urban to suburban, and to rural and natural areas. This will help us understand the role of areas with different levels of human development in preserving bee diversity, and in supplying bee pollinators for agriculture. The potential values of these various areas as sources of new commercial pollinator species are also important

Research is needed on ways to restore pollinator populations that have been negatively affected or extirpated by human activity. Restoration of wild bee populations can have clear benefits by providing enhanced background levels of crop pollination. Finally, systematic work (and additional systematists) are needed to improve our current understanding of bee taxonomy, and to provide bee identification services.

Several of these areas will have substantial input from DOI researchers, and can be done on DOI lands. Other areas are more within the purview of the ARS, but would be valuable to DOI in assessing the status of our nation's biological resources.

I hope this summary is useful to you. I look forward to seeing you at the workshop.

Sincerely,

Howard S. Ginsberg
USGS Patuxent Wildlife Research Center
Cooperative Park Studies Unit
Woodward Hall - PLS
University of Rhode Island
Kingston, RI 02882

(401) 874-4537 [office]
(401) 874-5296 [FAX]

ARS Websites

Agricultural Research Service
United States Department of Agriculture

The Agricultural Research Service (ARS), one of the Research, Education an Economics (REE) agencies, is the main in-house research arm of the United States Department of Agriculture (USDA).

USDA - ARS

http://www.ars.usda.gov/

arsweb@nal.usda.gov

Last Updated 13-October-1999

Bee Research Laboratory Home Page

The Bee Research Laboratory (BRL) conducts research on the biology and control of honey bee (*Apis mellifera* L.) diseases, parasites and pests to ensure an adequate supply of bees for pollination and honey production. Specifically, scientists are conducting research on two parasitic mites, *Acarapis woodi* and *Varroa jacobsoni*; American foulbrood and chalkbrood disease; the greater waxmoth and the small hive beetle. Additionally, scientists conduct research on the molecular characterization of honey bee genetic diversity and the *in vitro* preservation of honey bee germplasm. Because of the research specialties, BRL scientists provide authoritative identification of Africanized honey bees and diagnosis of bee diseases and pests for Federal and State regulatory agencies and beekeepers on a worldwide basis.

We Can Be Contacted At:

Bee Research Laboratory
Bldg. 476, BARC-East
Beltsville, MD 20705

Phone: 301-504-8205
Fax: 301-504-8736
E-mail: mfeldlau@asrr.arsusda.gov

(For phone and e-mail of individuals see listings under Staff)

Last modified: September 13, 1999

Research Units

VIRAL AND BACTERIAL DISEASES OF HONEY BEES

Objectives: (1) Develop molecular methods for the diagnosis of viral diseases of honey bees; (2) determine the economic impactof honey bee viruses. (3) Develop alternate methods for the control of American foulbrood disease. (4) Develop cultural and biological methods to control small hive beetle (SHB) larvae, determine population dynamics and economic thresholds of SHB, improve sanitary methods to eliminate beetles in honey processing; (5) develop new methods to control wax moth. (6) Identify candidate materials for the control of chalkbrood disease.
Investigators:

- Shimanuki, H.
- Hung, A.C.F.
- Feldlaufer, M.F.
- Kochansky, J.P.
- Pettis, J.S.

INTEGRATED PEST MANAGEMENT OF PARASITIC MITES OF THE HONEY BEE

Objectives: (1) develop in vitro rearing methods and/or a defined artificial diet that will support *Varroa* growth, development and reproduction for use in the evaluation of management strategies; (2) screen, evaluate, and field-test environmentally compatible compounds, natural products, and other compounds of botanical origin for their efficacy in controlling parasitic bee mites; and, (3) develop a rapid, reliable, and accurate means of detecting mite resistance to fluvalinate and other miticides.
Investigators:

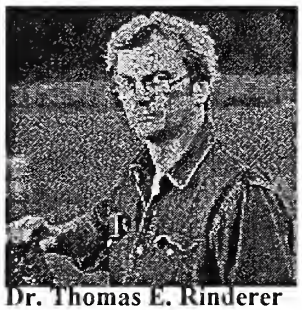
- Feldlaufer, M.F.
- Evans, J.
- Kochansky, J.P.
- Pettis, J.S.
- Shimanuki, H.
- Batra, S.W.T.

HONEY BEE GERMPLASM: DIVERSITY AND PRESERVATION

Objectives: (1) Develop methods for in vitro preservation of honey bee germplasm, including semen, eggs, embryos or tissues; (2) Improve molecular methods for characterization of honey bee genetic diversity; and, (3) Examine the biochemistry and physiology of honey bee queen spermathecae.
Investigators:

- Collins, A.M.
- Evans, J.
- Feldlaufer, M.F.

Research Leader Biography



Dr. Thomas E. Rinderer

Research Leader

Email:
trindere@asrr.arsusda.gov
(225) 767-9280, 767-9281
FAX (225) 766-9212

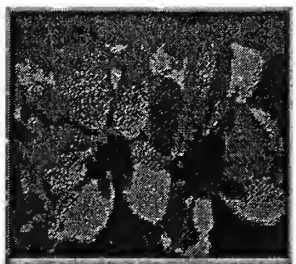
Honey Bee Breeding, Genetics, a Physiology Research Unit

1157 Ben Hur Road
Baton Rouge, LA 70820-5502
(225) 767-9280, 767-9281
FAX (225) 766-9212

Mission Statement

The mission of the Honey Bee Breeding, Genetics, and Physiology Research Unit is directed to improving honey b and honey bee management related to stock improvement. broad mission includes components related to problems ca Africanized honey bees, Varroa mites, and tracheal mites. continued interest in Africanized honey bee identification, certification, and population genetics of hybridization focu of the unit's work. The devastating problems caused by Var and the serious problems caused by tracheal mites focus th remaining portions of the unit's work.

Honey Bee Breeding, Genetics, and Physiology Research Homepage



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Comments

USDA - ARS - NPA
Bee Biology & Systematics Laboratory
Utah State University • 5310 Old Main Hill
Logan, Utah 84322-5310 USA

Greetings from beautiful Cache Valley located in Northern **Utah!**
The **United States Department of Agriculture,** Agricultural Research Service, **Northern Plains Area, BEE BIOLOGY & SYSTEMATICS LABORATORY** was founded in the late 1940s as part of the alfalfa seed production unit. We focus primarily on pollination research with bees. At web site, you will find information about our staff and programs. You will find links to other sites with related topics. We are physically located on the campus of Utah State University (USU) and our scientists maintain adjunct positions with the USU Department of Biology.

IN THE **NEWS!**
The Salt Lake Tribune **has two feature articles on the Bee Lab & Museum. The first article is about "The Bee Wranglers of USU: Learning the ins and outs of one of nature's most useful insects" and the other feature is on "To Bee, For Free: Museum is Abuzz With Bee Specimens." Both articles were written by Vince Horiuchi. A feature article on Dr. Frank Parker appears in Grist Magazine, "Bee All That You Can Bee: This scientist is making quite a buzz" by Lisa Jones.**

The *Deseret News* has published a feature article on our Bee Lab! Please access the web version HERE. There is a related article on Blue Orchard Bees used in pollinating cherry trees. *Frontier Airline's September-October 1998 Magazine* issue has a feature article "**The Latest Buzz**" by Heidi A. Schuessler. ***The New York Times Magazine,*** in their May 10, 1998, Section 6 issue, has an article **"Building a Better Bee: Scientists are grooming a new champion pollinator to relieve a honeybee population under siege"** by Karen Wright. Also, our activities at the Bee Lab were featured in the *Utah Science Magazine*, titled *Every Bee a Queen* in their summer issue.

We have compiled commercial and technical **resources relating to solitary bees**.

BeeWebKeeper

This page was last modified on 09/24/99.

Bee Biology & Systematics Laboratory • Utah State University • Logan, Utah-84322-5310 • (435) 797-2524

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Carl Hayden Bee Research Center

CHBRC Mission Statement

The research mission is to improve crop pollination and honey bee colony productivity through quantitative ecological studies of honey bee behavior, physiology, pests and diseases, and feral honey bee bionomics. The research program is problem oriented and based on the premise that all research is conducted in support of the public good by improving agricultural productivity and preserving the quality of life.

This research spans three major problem areas:

1. Improvement of honey bee pollination of fruit and seed crops and ecologically important plant species
2. Assessing the impact of mites and their microbes associated in honey bee colonies
3. New techniques for the detection and control of feral Africanized Honey Bees (AHB)

Facilities

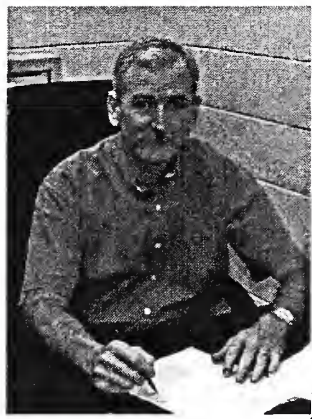
The Carl Hayden Bee Research Center is located on a 5.3 acre tract deeded to the United States Dept. of Agriculture by the University of Arizona and is about 5 miles from its main campus in Tucson, Arizona. The site allows for cooperation between Center personnel and the University staff.

Development of this facility was largely due to the efforts of Senator Carl Hayden. In honor of his contribution, the Bee Research Laboratory was named after him on April 9, 1979.

The present building was completed in 1966 and is equipped with the most advanced technical equipment and instruments. The main laboratory and office building covers more than one-third of an acre. Also on the site are large greenhouses, smaller isolation greenhouses, a shop area, a large storage building, three auxiliary office buildings and two small service buildings.

Beneficial Insects Research Unit

Kika De La Garza
Subtropical Agricultural Research Center
Located in Weslaco, Texas, USA



Walker Jones is the Acting Research Leader of the Beneficial Insects Research Unit.

Mission Statement	Research Programs
Research Areas	Personnel

Mission Statement:

The mission of the BENEFICIAL INSECTS RESEARCH UNIT (BIRU) is to develop scientific knowledge and technology for biologically-based management of crop pests through mass propagation and augmentative releases application of natural enemies. In addition the unit develops technology for managing honey bees in the presence of Africanized honey bees and parasitic mites.

Research Areas:

- Parasitic Mite control In Honey Bee Colonies Utilized in Honey Production And Crop Pollination
- Mass Propagation/Augemntation Of Wasp Parasites To Manage Weevils, Caterpillars, And Other Pests
- Biological Control Of Silverleaf Whitefly And Diamondback Moth On Vegetable Crops

Annual Report for 1996
Annual Report for 1997

Research programs

- ***Bemisia tabaci***
- **Biological control of Sweetpotato whitefly (*Bemisia tabaci*) using parasites , predators and pathogensor combined agents**
- **Foreign explorationfor natural enemies of B. tabaci**
- **Boll weevil (*Anthonomus grandis*)**
  Effects of fungal pathogens on non-target beneficial insects

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This page has been maintained by Reyes Garcia III

Send technical questions and comments regarding this page to: John M. Barrientes
http://rsru2.tamu.edu/biru.html
Last updated October 14, 1999

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Workshop Notes

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